



Corridor Integrated Weather System (CIWS)

Provides 0-2 hour “tactical” decision support for critical highly congested Great Lakes (GL) and Northeast corridors by application of ITWS technology.

This is a “research” concept exploration program

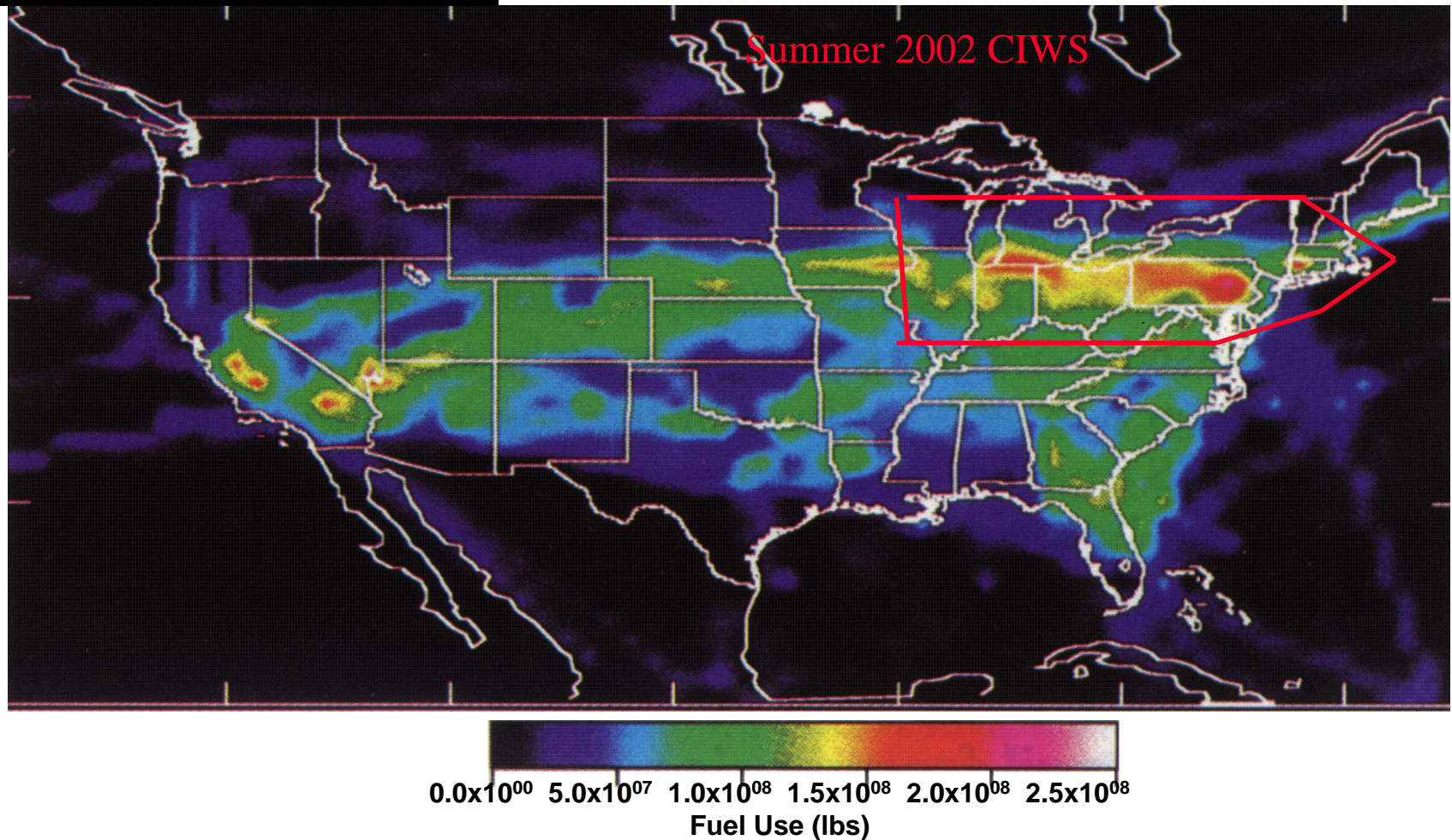
Outline

- **How often are “tactical” responses needed in the corridors?**
- **CIWS spatial coverage/user access**
- **Technology used for summer 2002 1-2 hour forecasts**
- **Summary**



Commercial and Military Fuel Burned (lbs./day) for May 1990

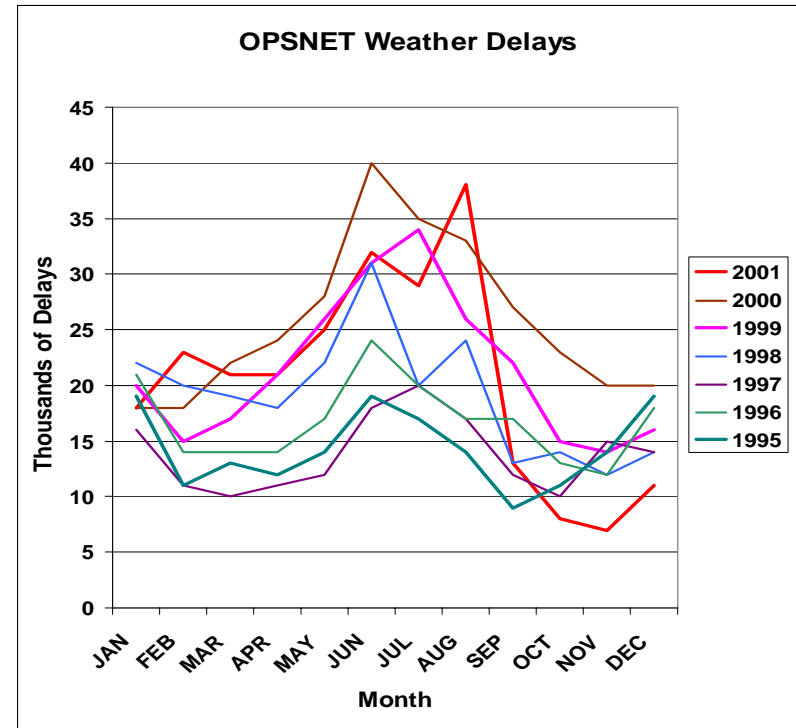
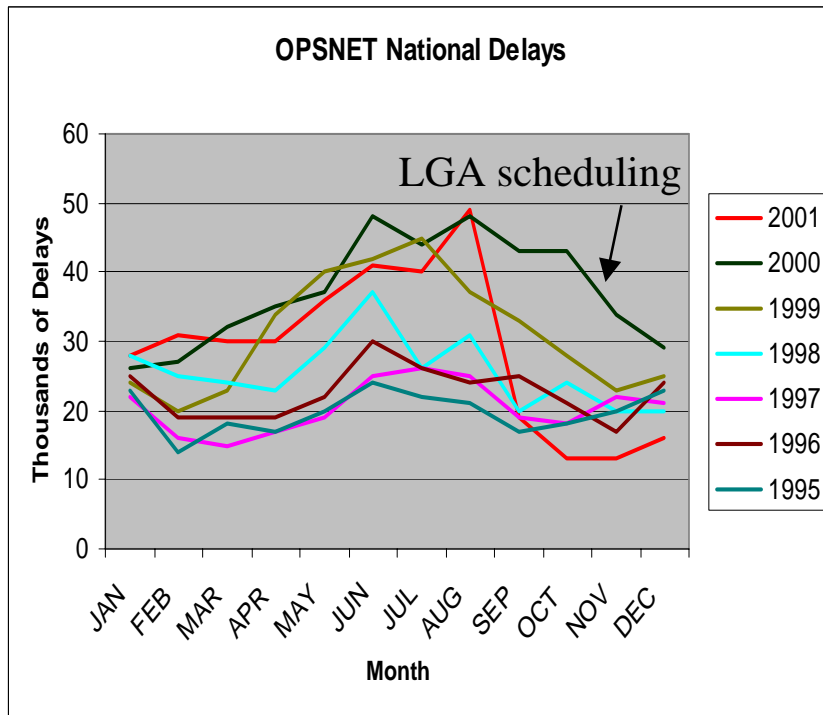
(above 7.0 km altitude)



Source: *Bulletin of the American Meteorological Society*, Vol. 78, No. 9, September 1997, p.1887.



Trends in Aviation Weather Delays



Note that delays have primarily gone up in months characterized by thunderstorm activity. Greatest impact is June-August which is time period in which convection is least “organized” (i.e., hardest to forecast)



How Often Are Tactical Measures Required in the Great Lakes Corridor?

- **August 2001 (which had the worst delays of any month for the last 6 years) was analyzed**
 - **There were no CCFP forecasts of coverage of 75-100% in a region**
 - **For 3 2-hour intervals, CCFP forecast wx coverage of 40-70%**
 - **For 69 2-hour intervals, CCFP forecast wx coverage of 25-39%**

These were significantly inaccurate (less wx than forecast, or more wx than forecast) about half the time

Most of forecast regions were extensive enough such that ATC would seek to partially use the region of forecast activity
 - **For 25 2-hour intervals, there was significant weather that was not forecast**
- **Conclusion: There were about 100 2 hour intervals during the month between 11Z and 01 Z that had operationally significant weather in the Great Lakes corridor: tactical responses were required in about 97% of these time intervals**



Example of “inaccurate” CCFP in a critical location

Green is actual level 3 or higher weather

Collaborative
Convective
Forecast
Product
Final
RTVS
VERIFICATION

Valid Time:
Aug 10, 2001 15Z

Issuance Time:
Aug 10, 2001 11Z

Forecast Length:
4hr

PODy: 0.37
CSI: 0.19
Heidke: 0.30
FAR: 0.72
% Area: 3.33
Bias: 1.35

FORECAST COVERAGE

HIGH = 74–100%	
MED = 50–74%	
LOW = 25–49%	

Actual % Coverage

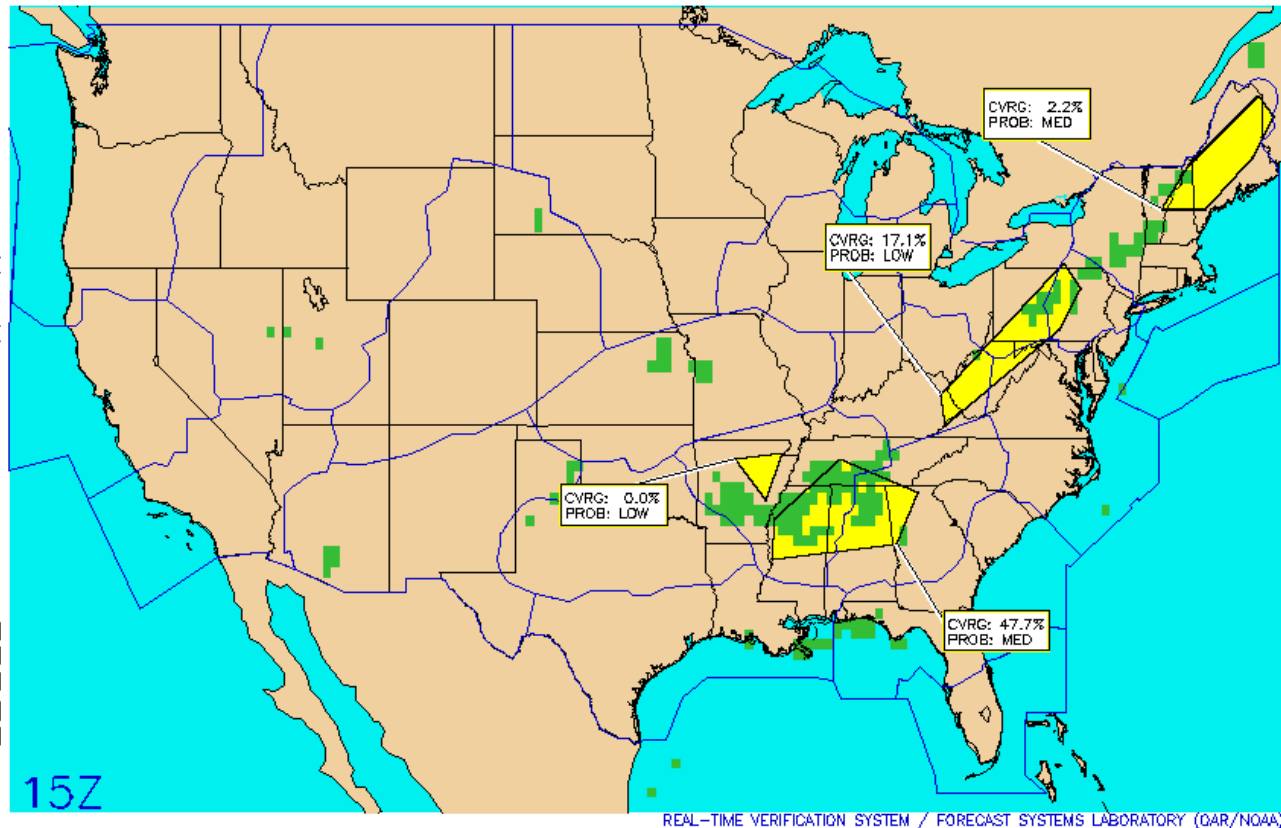
--	--

NCWD

--	--

PROB OF OCCURRENCE:

HIGH = 70 – 100%	
MED = 40 – 69%	
LOW = 1 – 39%	



**Significant weather north of West Va to Penn. forecast region ;
Not much weather in forecast region; CIWS products help reroute
traffic in upstate New York and in southern PA**



Example of Relatively Accurate, but Imprecise Forecast

Green is actual level 3 or higher weather

Collaborative
Convective
Forecast
Product
Final
RTVS
VERIFICATION

Valid Time:
Aug 10, 2001 19Z

Issuance Time:
Aug 10, 2001 15Z

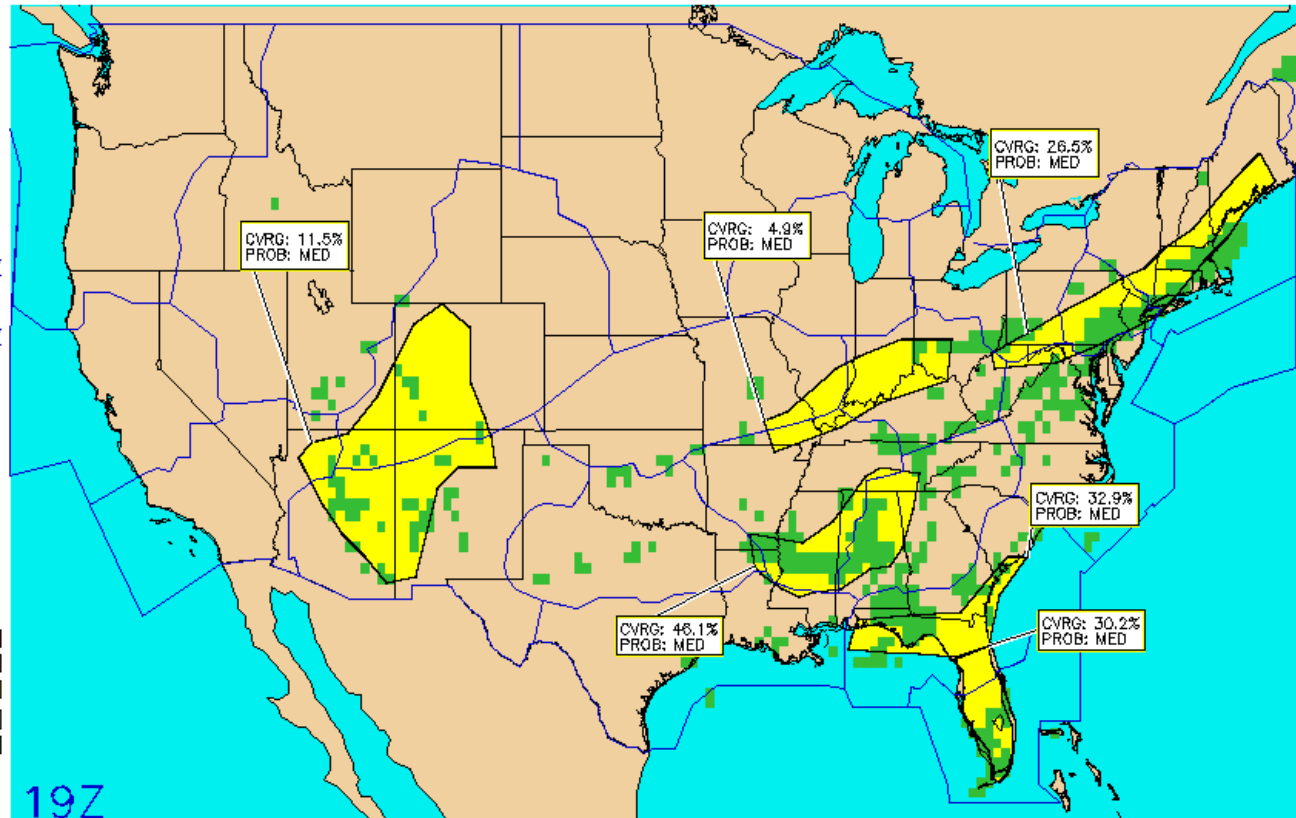
Forecast Length:
4hr

PODy: 0.38
CSI: 0.16
Heidke: 0.22
FAR: 0.78
% Area: 10.99
Bias: 1.75

FORECAST COVERAGE

HIGH = 74-100%
MED = 50-74%
LOW = 25-49%
Actual % Coverage
NCWD

PROB OF OCCURENCE:
HIGH = 70 - 100%
MED = 40 - 69%
LOW = 1 - 39%

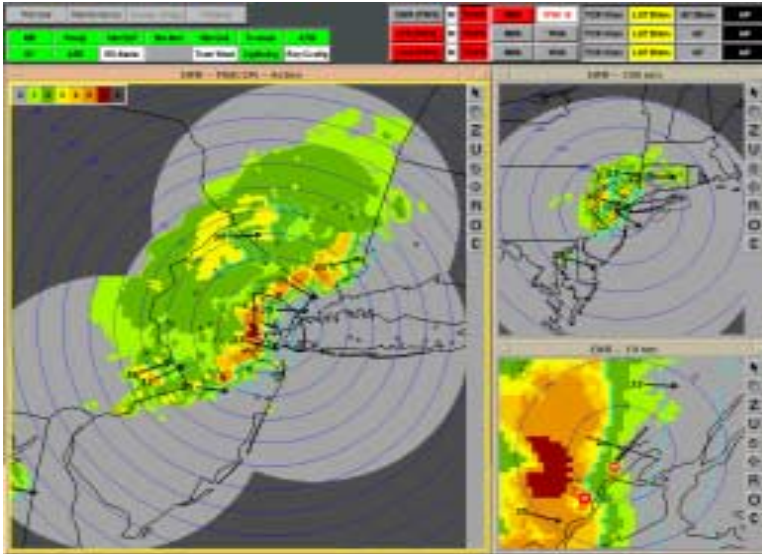


REAL-TIME VERIFICATION SYSTEM / FORECAST SYSTEMS LABORATORY (OAR/NOAA)

Forecast region from West Va to upper Maine is located such that routing through region is necessary if traffic is to get to the Northeast Corridor: CIWS products help to find routes around cells and through gaps

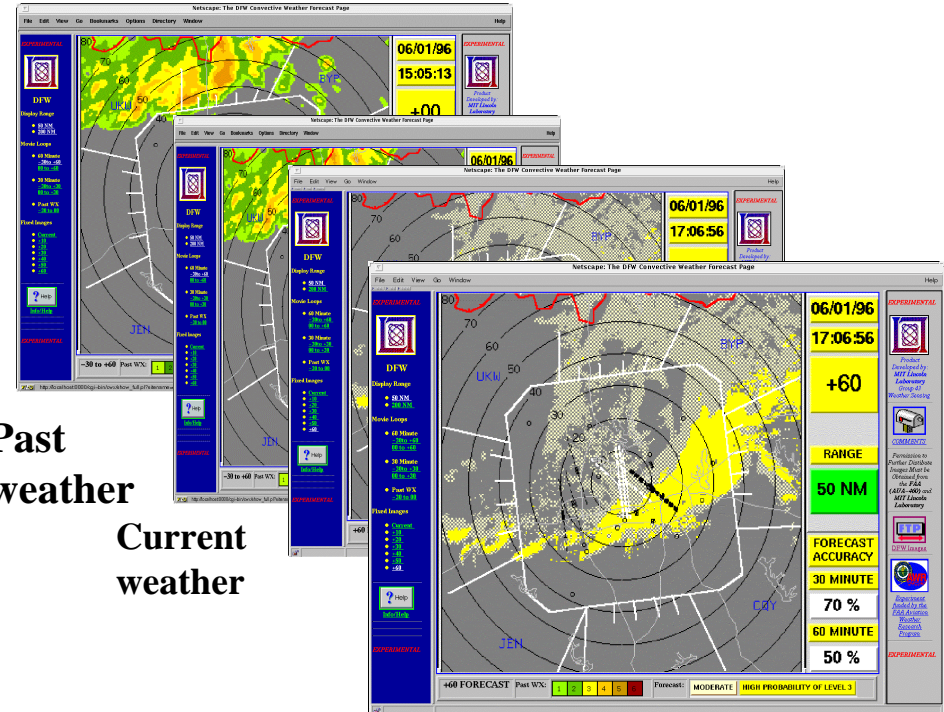


CIWS Forecast Products



Past
weather

Current
weather



+60 min Forecast

(+120 min forecast commences Aug 2002)

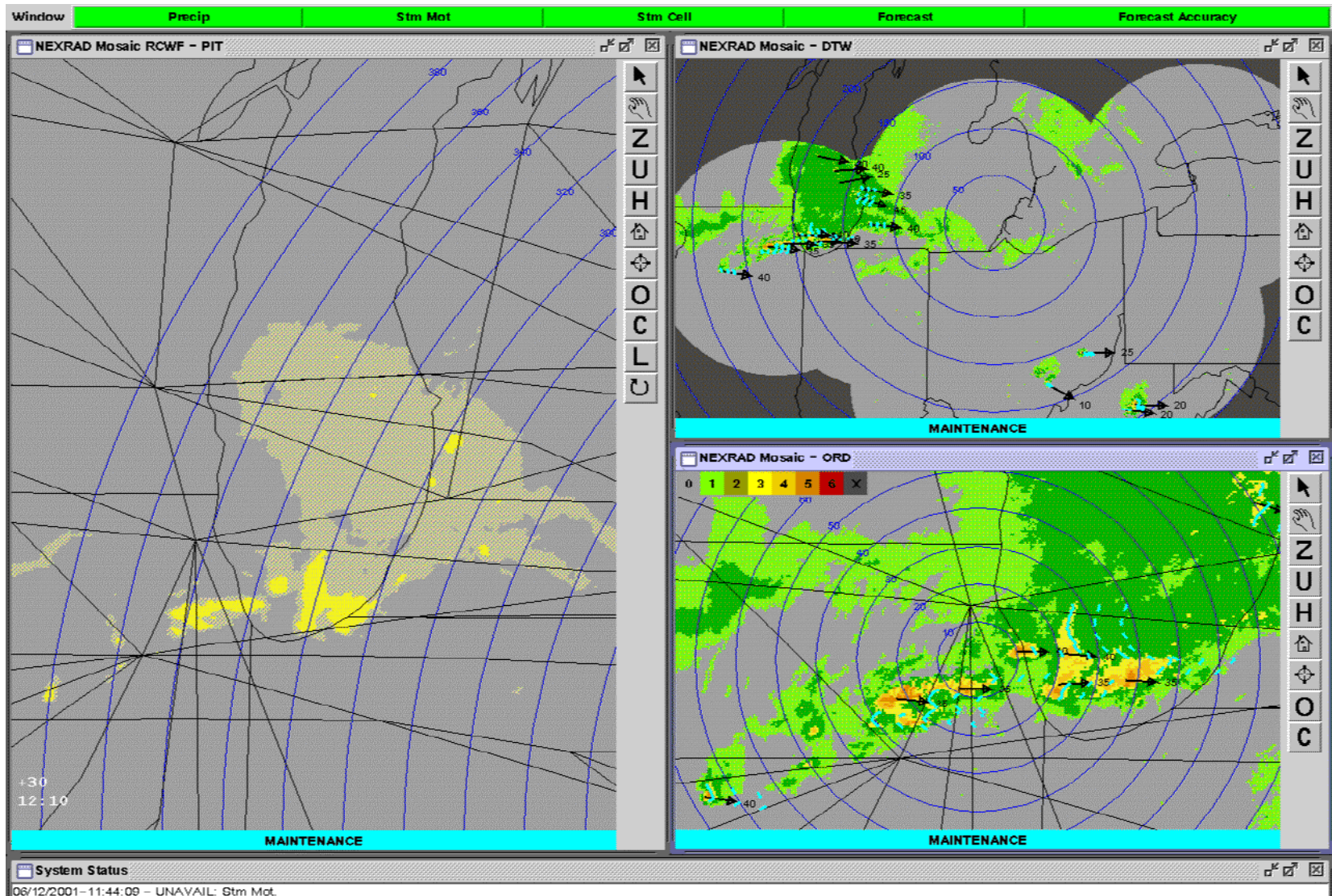
Cell motions
10 and 20 minute cell
position predictions
Tops information

Time loops of past and
predicted organized storm
positions with real time
indication of product accuracy

All forecasts update every 5 min



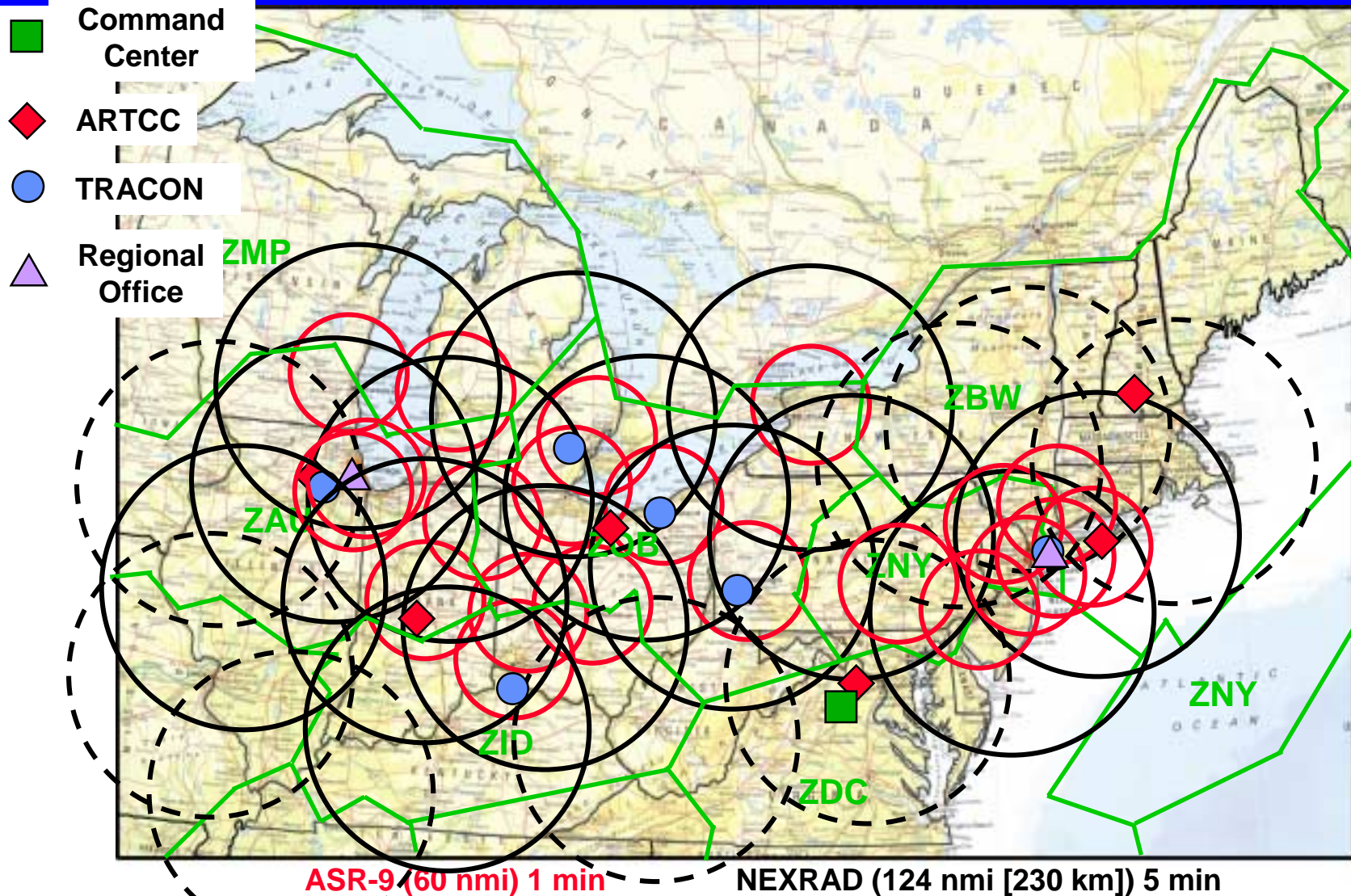
Initial CIWS Display





CIWS Sensors and FAA Users

End of April 2002





Utility of Various Features

Feature \ Forecast Horizon (minutes)	15	30	60	90	120
Growth Trend in Radar Signatures	High Skill	Low Skill	No Skill	No Skill	No Skill
Decay Trend in Radar Signatures	High Skill	High Skill	Moderate Skill	Low Skill	No Skill
Gust Front Forcing	Moderate Skill	Moderate Skill	Low Skill	No Skill	No Skill
Diurnal Anticipation	Low Skill	Low Skill	Low Skill	Low Skill	Low Skill
Improve Cell Motion Estimates	High Skill	Moderate Skill	Low Skill	No Skill	No Skill
Improve Line Storm Motion Estimates	High Skill	High Skill	Moderate Skill	Low Skill	Low Skill
Synoptic Scale Forcing	No Skill	No Skill	Moderate Skill	Moderate Skill	Moderate Skill
Relative Score	15	12	9	5	4

High Skill  3 points

Low Skill  1 point

Moderate Skill  2 points

No Skill  0 points



Airline/Military/Canadian/AWC Access

- **Java based Web browser display servers on Internet and CDMnet (pass word protected-we issue passwords to everyone who is an aviation user)**
- **Airlines: existing ITWS displays at airline SOC can be switched to CIWS on airline user request**
 - **Many airline user displays have been verified for this capability; some may need to have CPU upgraded**



Summary

- **“Fundamental” uncertainty in weather impacts on major corridors and terminals requires both current “strategic” planning and a robust “tactical” approach**
- **CIWS is a concept exploration that focuses on “tactical” capability in highly congested airspace**
- **Will provide 1-2 hour forecasts in 2002 with very high update rates (true 1 minute) high resolution (1-2 km) 3 D storm severity information**
- **Summer 2001 CIWS experience showed that reducing ATC workload associated with “tactical” reroutes in en route airspace is a critical factor in reducing delays**
 - **Seeking to develop CIWS interface to TFM and automation systems, but this probably will not occur in 2002**
- **Operational implementation of CIWS is under study**